

SIGNIFICANT CHANGES TO THE NFPA 70E STANDARD 2012 EDITION

Tech Topics:
Standards & Codes
Note 4, Issue 1

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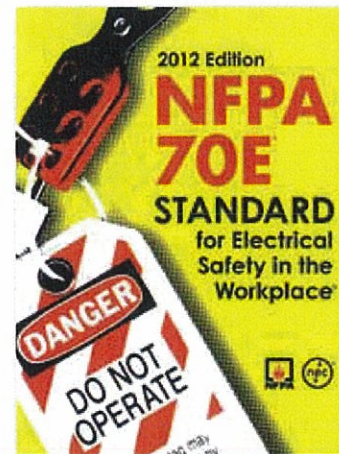
Points of Interest:

- Arc-Rated (AR) vs. Flame-Resistant (FR)
- Training requirements for emergency procedures
- Considerations for electrically safe working conditions
- Significant changes to Arc Flash Hazard Analysis equipment labeling
- Changes to Hazard Risk Categories with AC and DC Voltages

Introduction

NFPA 70E is a consensus standard whose stated purpose is to provide practical electrically safe work conditions. The development of NFPA 70E was originally promoted by OSHA in 1975 and the idea was accepted by NFPA to develop a new Standard. This standard only has the force of law if the authority having jurisdiction adopts it. OSHA, which holds a seat on the 70E technical committee, points to this standard as a practical way to comply with OSHA electrical safety regulations. OSHA recommends using the latest NFPA 70E edition available.

This Tech Topic is intended to highlight some of the important changes. This can be used to assist in the understanding of the new edition, not as a substitute.



Background

OSHA regulations are written in enforcement language. For instance, they state that workers should be protected against all recognized hazards. However the regulations are vague on how to implement the safety. OSHA has prevailed in court using 70E as an example of how an informed employer protects employees from electrical hazards.

The NFPA 70E endeavors to explain in detail how to prevent electrical hazards. The technical committee is made up of enforcers, end-users, equipment manufacturers, testing laboratories, and others to represent a cross-section of interests. Changes require a consensus of the technical committee members.

Changes to Definitions in Article 100

Arc-Rated (AR) versus Flame-Resistant (FR)

This edition explains that clothing considered Personal Protective Equipment (PPE) has to be certified Arc-Rated (AR) not just Flame-Resistant (FR). Article 100 contains an expanded definition of Arc Rating.

Many trades have the occasion to use FR clothing for their hazards. The hazard of arc flash requires different construction and properties than just flame resistance. NFPA 70E terminology of FR was replaced with AR throughout the new edition.

Arc Flash Protection Boundary is now Arc Flash Boundary

The word "Protection" was deleted and a new informational note added. The note explains a second degree burn is possible with as few as 1.2 cal/cm².

Addition of Article 105

Application of Safety-Related Work Practices

This new article is an introduction to Chapter One. Most of this already existed in Article 110, but it was separated into Article 105.



Changes to Article 110

Paragraph 110.1(C)(1) – Relationships with Contractors

The required meeting between host employer and external contractor now has to be documented.

Paragraph 110.2(C) – Training Requirements for Emergency Procedures

Employees who are electrically qualified or are responsible to respond to an electrical accident have another certification requirement. Automatic external defibrillator (AED) training shall be certified by the employer annually in addition to the prior resuscitation and CPR training.

Paragraph 110.2(D)(1)(f) – Qualified Person Training Compliance

The employer shall use regular supervision or inspections on at least an annual frequency to determine employee compliance with this standard. The OSHA law of CFR 1910.269(a)(2)(iii) is stricter, requiring supervision AND inspections.

Paragraph 110.2(D)(3) – Employee Retraining

In addition to retraining for non-compliance, new equipment, or unfamiliar procedures, retraining shall be performed every three years or more frequently.

Paragraph 110.2(E) – Training Documentation

The employer must now retain a description of training content in addition the employees' names and date of the training.



Paragraph 110.3(H) – Electrical Safety Auditing

This new section requires the employer's electrical safety program be audited at least every three years. This audit is to include field work, not just a review of paperwork. If discrepancies are identified in the audit, appropriate changes in training or procedures shall be implemented. The audit shall be documented.

Paragraph 110.4(C) – Ground-Fault Circuit-Interrupter (GFCI) Protection

Wherever GFCI protection is required by other applicable standards, it is also required by 70E. Similar to OSHA requirements, outdoor use of portable equipment supplied by 125 volt 15-, 20-, or 30-amp circuits shall be protected by GFCIs. With other outdoor equipment an assured grounding conductor program shall be implemented. [An example of a program is in the NEC 590.6(B)(2).]

Paragraph 110.5 – Excavation of Underground Electrical Lines

If there is a reasonable possibility that excavation could contact an electrical line or equipment, the owners of the equipment shall be contacted to determine and mark the location and hazards. Then a hazard analysis shall be performed for safety practices during the excavation.

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Changes to Article 130 – Arc Flash Hazard Analysis

Paragraph 130.2 – Electrically Safe Working conditions

There were revisions in the arrangement of this Article. This paragraph could require placing the equipment into an electrically safe work condition more often. If the employee will be within the limited approach boundary, or the employee is interacting with equipment that has an increased chance of creating an arc flash, the equipment must be de-energized. An example is switching a circuit breaker that has not been properly maintained.

Paragraph 130.2(B)(1) – When an Energized Electrical Work Permit is Required

Now the energized work permit will be required when an employee is working within the limited approach boundary or the arc flash boundary. This is still subject to the prior exceptions such as diagnostic work.

Deletion of Former Paragraph 130.3 Exception No. 1

The prior edition did not require arc flash hazard analysis for certain circuits 240 volt and less supplied by small transformers. This exception was rescinded. Now in 130.5 Informational Note No. 5 it refers to the IEEE 1584 Standard for any details regarding these circuits.

Paragraphs 130.4(B) and (C) – DC Shock Protection Boundaries

DC shock protection information was added to the new table 130.4(C)(b). It has the same format as the AC table which is table 130.4(C)(a).

Paragraph 130.5(B)(1) – PPE Selection with Calculated Arc Flash Hazard Analysis

A new sentence in the prior informational note refers to new Table H.3(b) for selecting PPE based on calculations of incident energy. This new table is included in Informative Annex H.3. This was added to clarify the difference between selecting PPE based on the table method versus the calculation method.

Paragraph 130.5(C) – Arc Flash Hazard Analysis Equipment Labeling

The required labeling has significantly changed. The 2009 edition started the requirement for arc flash analysis equipment labeling. This prior edition only required field marking on equipment displaying available incident energy or required level of PPE.

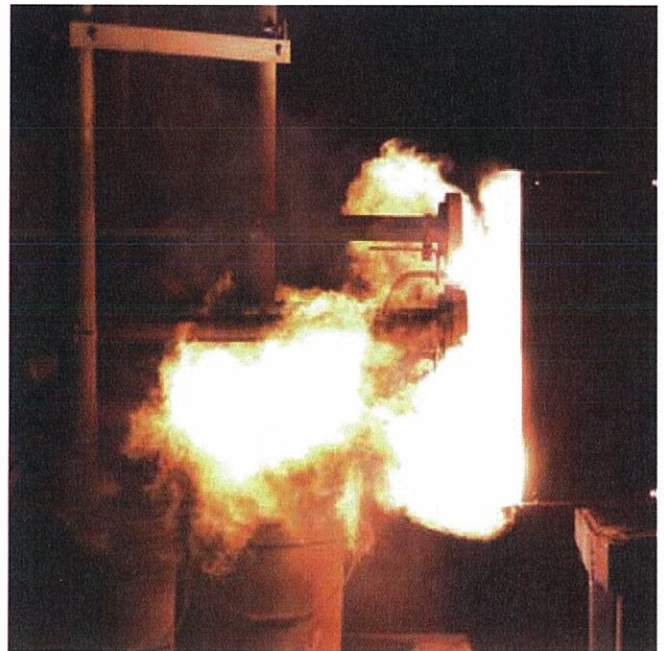
The new edition is more specific with the equipment requiring labels. Only equipment that would be worked on in an energized state requires the labeling.

The labels have to include the following three lines of information

- 1) At least one of the following
 - a. Available incident energy and the corresponding working distance or
 - b. Minimum arc rating of clothing or
 - c. Required level of PPE or
 - d. Highest Hazard/Risk Category (HRC) for the equipment
- 2) Nominal system voltage
- 3) Arc flash boundary

The one exception is that if the labels were applied prior to September 30, 2011, they are acceptable if they contain the available incident energy or required level of PPE.

The method of calculating and supporting data shall be documented.



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Paragraph 130.7(A) and (C)(15) Informational Notes 2 – Safe Normal Operation of Equipment

The informational note of 130.7(A) declares that properly maintained electrical equipment rated not more than 600 volts is not likely to present a hazard to workers. This contrasts with Informational Note 2 of section 130.7(C)(15) where the equipment is expected to change state. In this case the equipment closed doors do not provide enough protection without PPE.

Paragraph 130.7(C)(5)– Additional Requirement for Hearing Protection

Employees shall wear hearing protection when working within the arc flash boundary. The existing requirement has been to wear hearing protection in HRC 0 or higher locations if performing a listed task..

Paragraph 130.7(C)(9)– Restriction with Arc Rated Clothing Systems Using other Clothing

The rating of a clothing system can not be increased by use of non-arc rated clothing.



Paragraph 130.7(C)(10)(b)– New Requirements for Head Protection

An arc rated balaclava or arc rated hood shall be worn when the back of the head is within the arc flash boundary. An arc rated hood shall be worn when the hazard exposure is over 12 cal/cm².

Paragraph 130.7(C)(10)(d)– Modified Requirements for Hand Protection

The requirement for leather gloves or FR gloves was changed to heavy duty leather gloves or arc rated (AR) gloves. The Informational Note describes what is considered a heavy duty leather glove.

Table 130.7(C)(15)(a)– Hazard Risk Categories with AC Voltages

This table name was changed from 130.7(C)(9) to 130.7(C)(15) (a). The content changed as follows:

- 1) The conditions of applicability were relocated from footnotes to the equipment headings. For example, a panelboard with voltages >240 up to 600 has a maximum of 25kA short current available, maximum clearing time of upstream protection of 2 cycles, and a minimum working distance of 18 inches. If the equipment does not conform to the conditions, the calculation method must be used for incident energy analysis per 130.7(C)(15).
- 2) The equipment descriptions now include the arc flash boundary distance based on the conditions of applicability.
- 3) The hazard risk category (HRC) 2* was replaced with HRC 2. In essence HRCs 2 and 2* were combined and the stricter PPE requirements of HRC 2* now apply to the HRC 2.
- 4) The prior equipment category of "Panelboards or Switchboards Rated >240 V and up to 600 V" was modified to "Panelboards or other equipment rated >240 V and up to 600 V," deleting "Switchboards."
- 5) The equipment category 600 V class motor control center (MCC) was split into two sections with differing conditions. The first category pertains to working within the buckets. The second section pertains to interacting with a bus.

Table 130.7(C)(15)(b)– New - Hazard Risk Categories with DC Voltages

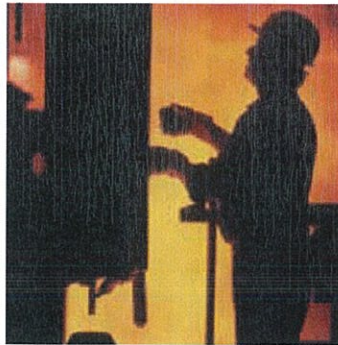
A new table for hazard risk categories was added for DC equipment. It is in a similar format as the AC equipment table. The maximum voltage range included is 600 volts DC. Guidance is given in Informative Annex D in section D.8 on calculating DC incident energy where the equipment is not covered in the new table.

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Changes to Chapter 2 – Safety Related Maintenance Requirements

Section 205.2– Single Line Diagram

The added requirement states that, “A single-line diagram, where provided for the electrical system, shall be maintained in a legible condition and shall be kept current.” This is not requiring a single-line diagram, but if one is used, it has to be readable and be updated.



Section 205.4– Added Requirement for Overcurrent Protective Devices

Maintenance, tests, and inspections shall be documented. This pertains to the required maintenance in section 205.3.

Changes to Chapter 3 – Safety Requirements for Special Equipment

Article 320– Batteries and Battery Rooms

This article was extensively revised. Many of the revisions deleted installation requirements which are found in other standards.

Changes to Informative Annex O – Safety Related Design Requirements

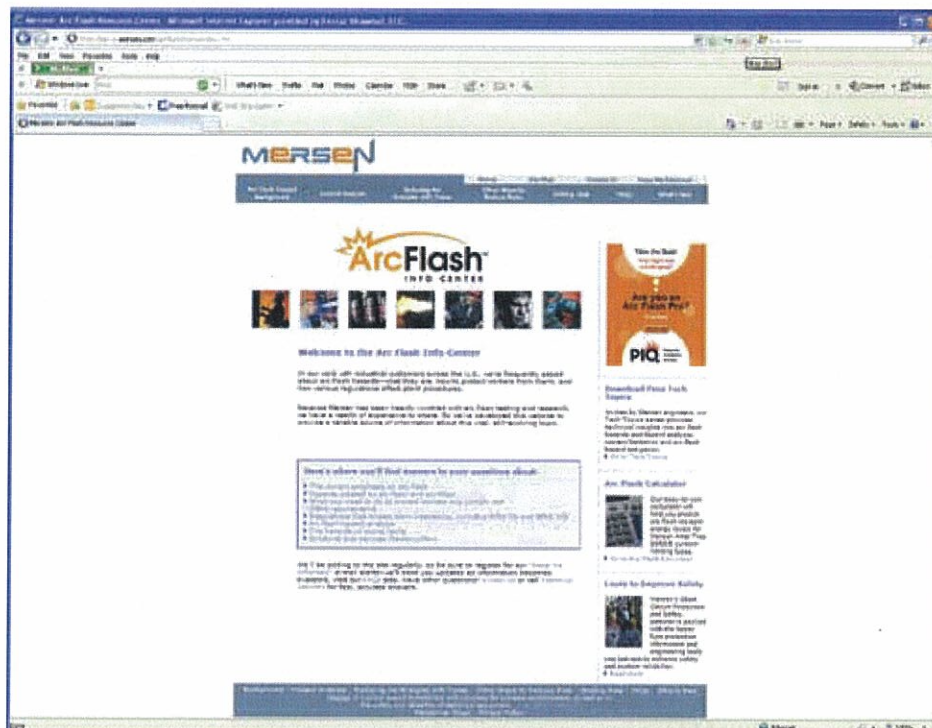
Section O.2.3– Arc Energy Reduction

This informative annex suggests that where a circuit breaker can be adjusted for a trip level of 1,000 amps or more, additional controls be added. Most circuit breakers are not current limiting such as fuses and these circuit breakers can allow the release of tremendous amounts of incident energy. Some suggested modifications include:

- 1) Zone selective interlocking
- 2) Differential Relaying
- 3) Energy reducing maintenance switching capabilities with local status indicator

Conclusion

NFPA 70E has numerous significant changes in the 2012 edition. This paper can be used to identify relevant changes to your safety program. This Tech Topic is intended to make it easier to update an electrical safety program, not as a substitute for the current 70E Standard.



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When it comes to low current-limiting thresholds and low let-through energies, there is no better alternative than the Amp-Trap 2000 fuses. They offer:

- Best degree of arc energy mitigation. When applied so that the fuses will be current-limiting for arc fault currents, incident energy at working distances of 18" are typically less than 0.25 cal/cm².
- Easy system coordination. With Amp-Trap 2000 fuses, selective coordination is ensured by maintaining a 2:1 ratio between upstream and downstream ampere ratings.
- Type 2 protection for motor starters. The A6D and AJT fuses have been certified by starter manufacturers to provide Type 2 (No-Damage) short circuit protection for NEMA and IEC starters.
- Easy Recognition. A high-visibility orange label gives clear indication that you are using the right current-limiting fuse.
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Additional Resources - Tech Topics

- Arc Flash Note 1: Multiple Hazards of Arcing Faults (part no. TT-AFN1)
- Arc Flash Note 2: Reducing Arc Energies with Current-limiting Fuses (part no. TT-AFN2)
- Arc Flash Note 3: Arc Flash Hazard Analysis is Required (part no. TT-AFN3)
- Arc Flash Note 4: Reduce Arc Flash Energy by Upgrading to Class RK1 Fuses (part no. TT-AFN4)
- Component Protection Note 2: Enhancing Short Circuit Safety with Type 2 Protection of Motor Starters (part no. TT-CPN2)

Other Application Literature & Resources

- Type 2 Motor Starter Protection Fuse Selection Guide
- Amp-Trap 2000 Brochure (part no. BR-AT2000)
- Advisor: Selectivity Between Fuses (See Application Section)
- Arc Flash Info Center: ep-us.mersen.com/arcflash
- 2012 Handbook for Electrical Safety in the Workplace available from NFPA.org
- Mersen Arc Flash White Paper and Articles available at ep-us.mersen.com
- Mersen Technical Services email: technicalServices.nby@mersen.com



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